USING NATURAL GAS AS A PASSENGER BUS FUEL

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Why Use Natural Gas in Buses?

- Air Quality
  - Reduced PM
  - Reduced Ozone
  - Reduced Air Toxics
- Economics
  - Domestic Resource
  - Less Expensive
- Climate Change
  - Reduced GHG Emissions

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Natural Gas Buses in the U.S.

- 3500 CNG Buses currently in operation (7% of 50,000)
- 20-25% of all new transit buses on order are natural gas buses (CNG or LNG)
- All full-size transit bus manufacturers in the U.S. offer natural gas buses
- Natural gas buses are most in demand where air quality is an issue

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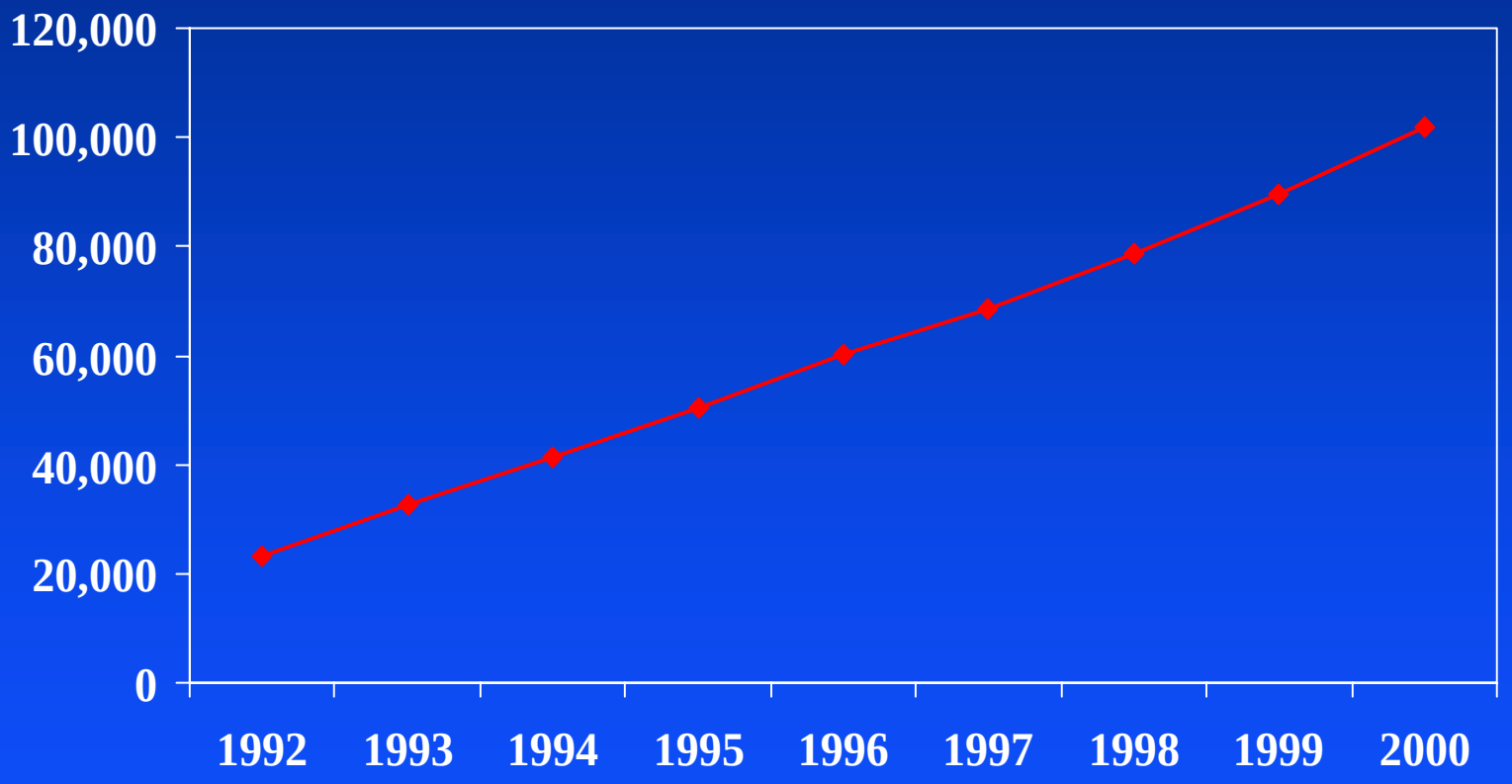
NGVs in the U.S. are Growing



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There are Two Ways to Use Natural Gas in Buses

- Compressed Natural Gas (CNG)
  - Used most frequently now
  - Stores gas at 3000 to 3600 psi
  - Fuel system volume about 5 times that of diesel fuel
- Liquefied Natural Gas (LNG)
  - Stores NG as a liquid at around -240°F (-150°C)
  - Fuel system volume about twice that of diesel fuel

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A Typical CNG Bus

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LNG Buses

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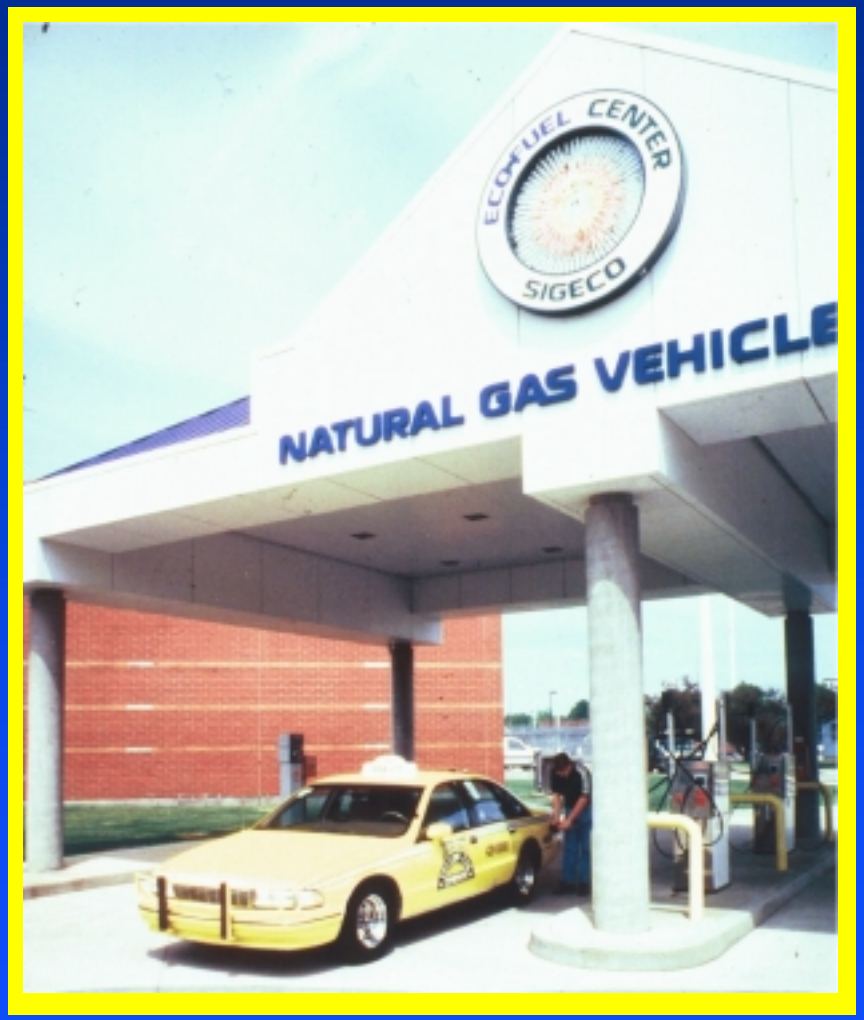
A Typical CNG Refueling Facility



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An LNG and CNG Refueling Facility

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Prerequisites for Implementing Natural Gas Buses

- A Willing Bus Fleet Operator
- Natural Gas Supplier
- No “Show-Stopper” Regulatory Hurdles
- Financial Capability

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Changes to Bus Fleet Operations

- Training
  - Drivers
  - Maintenance Staff
  - The Public
- Facility Modifications
  - Bus Storage and Maintenance
  - Refueling Facility (if put on-site)

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Financial Considerations

- NG Buses Cost More
  - 10% to 20% more than conventional diesel
- Refueling Facilities More Expensive
- Fuel Costs are Reduced
- Life-Cycle Costs are Lower Without Accounting for Public Health Benefits

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Typical Refueling Capital Costs to Serve 200 Transit Buses

CNG	$2,700,000
LNG-to-CNG	$1,800,000
LNG	$ 950,000
Diesel Fuel	$ 350,000

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Typical Reactions to Natural Gas Buses

- Public Notices Lack of Smoke and Smell, and Reduced Noise
- Mechanics Report Buses Cleaner to Work On
- Drivers Tend to Accept Quickly

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Other Clean Bus Options

- "Clean Diesel" Buses
  - Require Ultra-low Sulfur Diesel Fuel
  - Dependent on Emission Control Technology for Emission Benefits
  - Increased GHG Emissions Compared to Conventional Diesel Buses
  - Fuel Cost Greater Than Conventional Diesel Fuel
  - Probably 5 to 10 years away

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Other Clean Bus Options (Con't)

- Hybrid Technology
  - Emissions not as low as Natural Gas Buses
  - Lower Fuel Consumption
  - Lower GHG Emissions
  - More Expensive than Natural Gas Buses
  - Requires Ultra-low Sulfur Diesel Fuel to Achieve Emissions Benefits
  - Probably 5 to 10 years away

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Closing Remarks

- Natural Gas Buses Provide Several Benefits to Latin American and Caribbean Countries
  - Proven Technology
  - Available Now
  - Domestic Fuel Resource
  - Improved Air Quality
  - Lower GHG Emissions

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U.S. Department of Energy's Clean Cities Program International Activities

- Clean Cities International facilitates international exchange and government/ industry partnerships to promote alternative fuel technologies in order to address shared energy and environmental issues
- Developing countries can make use of U.S. AFV technology to mitigate pollution problems and build sustainable transportation
- The U.S. can share lessons learned to help countries from making the same mistakes

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Clean Cities International is Sponsoring...

- Trade mission to Monterrey, Mexico, April 12-14, 2000
  - Focus: Trucks
- Clean Cities Conference, May 7-10, 2000
  - Session with international delegation
  - Training on greenhouse gas reduction
- Santiago Workshop, May 22-24, 2000
  - Focus: Transit
  - Invitees: Chile, Argentina, Brazil
- www.ccities.doe.gov

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